PII-143CV3

Graphicsmith Card
User Manual

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Checklist

Your Graphicsmith package contains the following:

- One Graphicsmith card.
- One user manual.

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Introduction

You can rest assured of having made a wise choice in buying the Hercules-compatible Graphicsmith Monochrome Card to enhance the display functions of your IBM PC®, PC/XT®, PC/AT® or compatible computer. With its monochrome display port, the Graphicsmith will enable your computer to interface with a 720 x 348-resolution monochrome monitor. The Graphicsmith also has a parallel printer port.

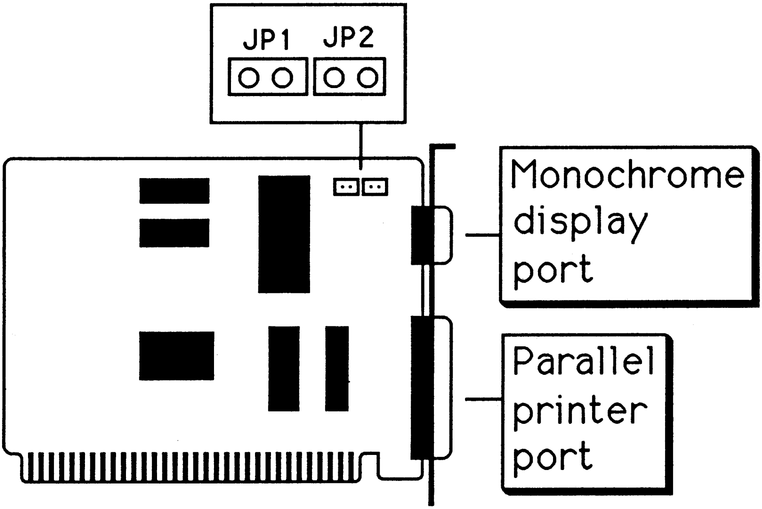
The Graphicsmith is fully compatible with Hercules-compatible monochrome cards and software produced for them.

Each of the two graphics pages used by the Graphicsmith card are in standard 720 x 348 resolution. And the most popular graphics applications software packages, such as AutoCAD® and Lotus 1-2-3®, work with the Graphicsmith.

The clear, well-illustrated instructions in this manual ensure that, even if you are a newcomer to the computer world, you will have the Graphicsmith installed and running with a minimum of effort.

Card layout and ports

The illustration below will familiarize you with the layout of the Graphicsmith Monochrome Printer Card and the location of the ports:



Functions

The Graphicsmith has a monochrome display port and a parallel printer port designed to work with the IBM® dot matrix printer and compatibles.

The monochrome display operates in two modes: text and graphic. The two modes are defined as follows:

Text	80 columns x 25 lines.
Graphic	720 x 348 addressable dots. Display buffer stores two screen-sized pages.

Text generation

The character box in the text mode is 9 x 14 dots. The attributes of the character mode are predefined, and you can specify an eight-bit code to control the attributes of each character (code key found in **Technical information** section). The attributes are defined below:

Normal — light character on dark background
Reverse — dark character on light background
Highlight — bold character
Blink — blinking character
Underline — underlined character

Installation

Jumper settings

Refer to the illustration on page 2 to find the positions of these jumpers and the port. The jumper settings for JP1 and JP2 are shown in the table below:

JP2	JP1	Printer
short	short	disable
open	short	LPT2
open	open	LPT1

Card installation

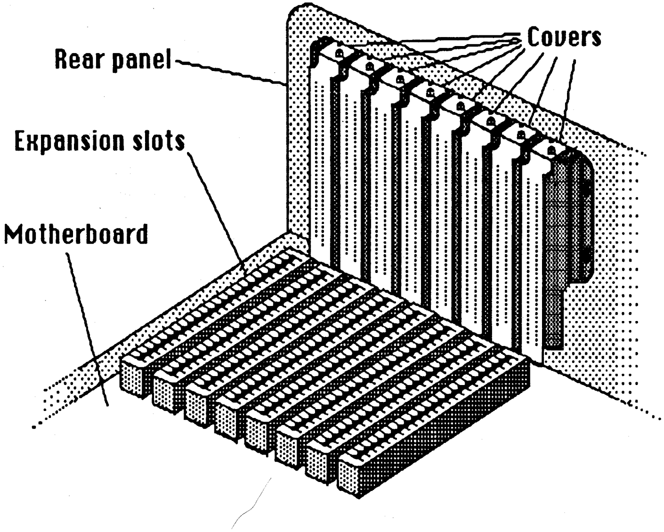
Before opening up your computer to install the Graphicsmith, ensure that the power supply to your system is switched **OFF**.

Refer to your computer's user manual to open it up.

Ensure that :

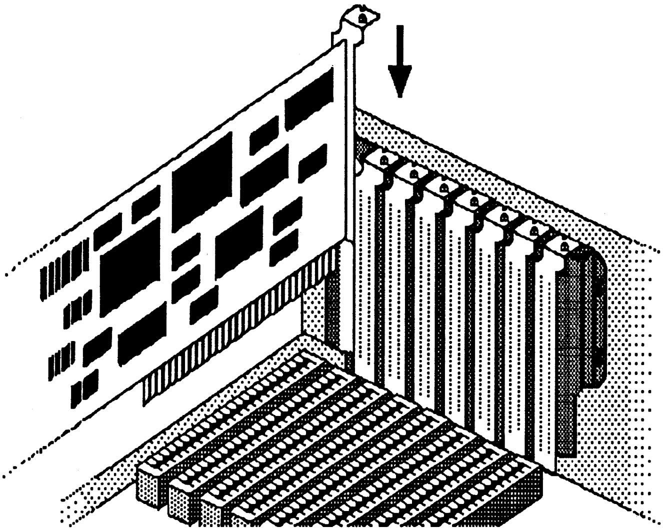
- no video board using the same screen buffer memory map is inserted in one of the expansion slots.
- no other card in any of the expansion slots has the LPT1 printer port identity; otherwise, the Graphicsmith may not function correctly.

With a nutdriver or a small screwdriver (usually a Phillips) remove the cover at the back of an unused slot. Keep the screw to attach the card. Refer to the illustration below.



Before you install the card in your computer, make sure the computer is unplugged, and then remove any static electric charge from your body by placing one hand on the power supply box inside your computer.

Pick up the Graphicsmith card by its non-conductive edges. Avoid touching the connector contacts or any components with your hands as this could damage the card. Insert the card into an empty expansion slot as shown in the following illustration:



Attach the mounting bracket of the card securely to the rear panel of your computer with the screw you saved. Change the switch settings on the motherboard for a monochrome display (refer to the user manual of your computer or motherboard for the appropriate settings) or more than one monitor. Do not count the 64K screen buffer on the Graphicsmith card when setting the switches for system memory.

Finishing up

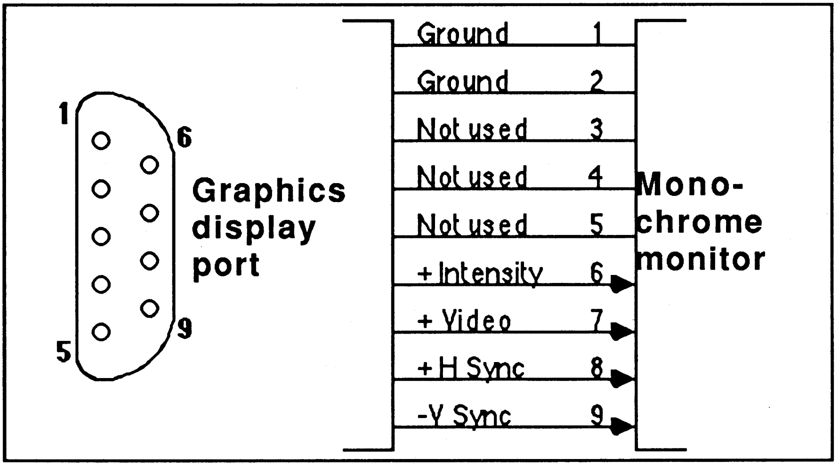
If you have any other cards to install put them in now following the same steps as those for the Graphicsmith card. When all of your new cards have been installed, you can close your computer.

Connections

The illustration below shows the port on the Graphicsmith and its pinouts.

NOTE: Do not connect color displays to the monochrome display port. The timing of color monitors differs from that of the monochrome display port and your color monitor will be permanently damaged if it is connected to the Graphicsmith.

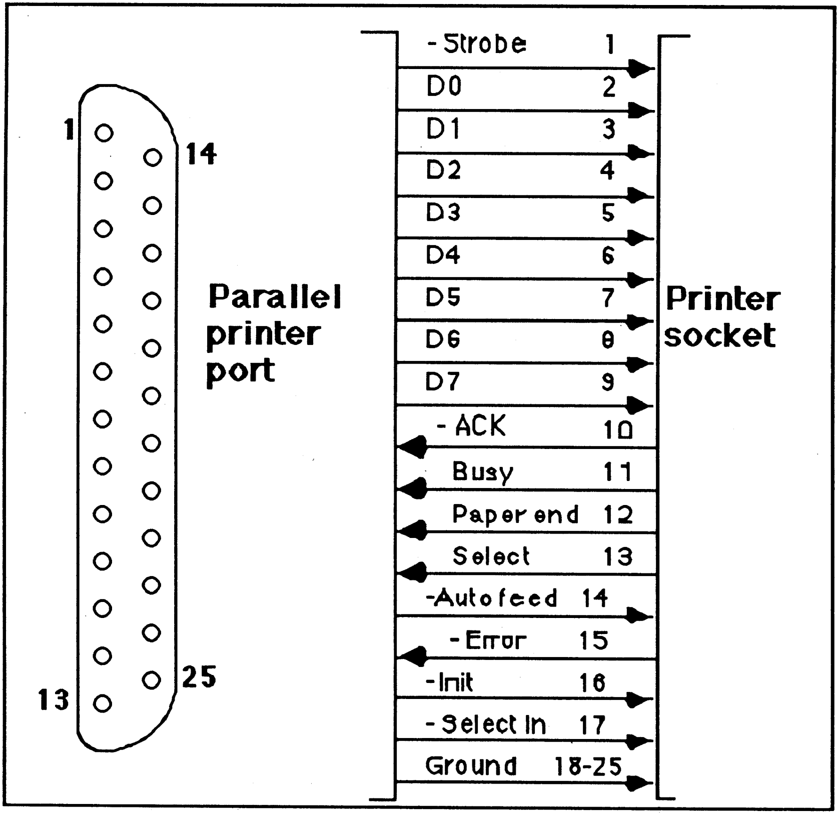
Graphics display port and pinouts



The Graphicsmith has a standard interface for a parallel printer. This port, a female DB25 connector, is completely IBM® compatible.

The parallel printer port on the Graphicsmith card is always addressed as LPT1. For this reason, if another port in your system is already addressed as LPT1, it will become LPT2 after you install the Graphicsmith. A total of three parallel printers may be connected in your system.

Parallel printer port and pinouts



Hotkey 1-2-3

To start Lotus 1-2-3® with three keystrokes upon installing your Graphicsmith monographic card, do the following:

- After placing the Lotus 1-2-3® system disk in drive A of your system, edit the system disk's AUTOEXEC file by typing in:

```
COPY CON:AUTOEXEC.BAT           <ENTER>
DATE                            <ENTER>
TIME                            <ENTER>
LOTUS                           <ENTER>
F6 (function key F6)            <ENTER>
```

- Type in the same as shown above for the Lotus 1-2-3® backup system disk if you have one.

You can now "hotkey" Lotus 1-2-3® by pressing <Ctrl>-<Alt>-<Del>.

Screen buffer

What is a screen buffer?

A screen buffer is memory provided for the screen data. This is necessary because graphics take up considerably more memory than text does. The following two sections explain what half-screen and full-screen buffers are.

Half-screen buffer

The half-screen buffer allows graphics software to access the first graphics page (page 0) but the second page is suppressed to permit use of other graphics cards. Graphics are enabled on the first page only. The address of the display buffer is B0000-B7FFF, bit 0 is 1 and bit 1 is 0 for port 3BF in this configuration.

Full-screen buffer

The full-screen buffer allows graphics software to access both graphics pages. The address of the display buffer is B0000-BFFFF, bit 0 is 1 and bit 1 is 1 for port 3BF in this configuration.

NOTE: Remember to program Mode Control Port 3B8H (bit 1 and bit 7) to select the correct operation mode if necessary. Refer to the **CON: interface** section on page 16.

NOTE: Lotus 1-2-3® and AutoCAD® require full screen buffer configuration.

Assembly language or BASICA® may be used to program bit 0 and bit 1 of port 3BF as shown in the table below:

Bit 1	Bit 0	Configuration	BASICA command
0	0	Text	OUT 3BF,0
0	1	Half screen buffer	OUT 3BF,1
1	1	Full screen buffer	OUT 3BF,3

Technical information

The 64K system RAM on the card is divided into two video buffers of about 32K each. The two video buffers are used by the two graphics pages.

Logic device identities

CON: = Monochrome display
I/O = Input/Output
O = Output
I = Input

I/O ports (Non DMA only)

(O)	03B4	=	6845 Index Register
(I/O)	03B5	=	6845 Data Register
(O)	03B8	=	CON: Mode Control Port
(I)	03BA	=	CON: Status Port
(I/O)	03BC	=	LPT1: Data Port
(I)	03BD	=	LPT1: Status Port
(I/O)	03BE	=	LPT1: Control Port
(O)	03BF	=	Configuration Switch

Graphic dot generation

In this bit-mapped mode, the display buffer can store two screen-sized pages which may be alternately displayed.

Alterations to the buffer for the displayed page will alter screen display while for the page that is not displayed, alterations will be shown only when that screen is selected.

Page selection through bit 7 of CON: Mode Control Port

0 for page 0
1 for page 1

CON: buffer

Page 0 = B0000 — B7FFF (32K)
Page 1 = B8000 — BFFFF (32K)

Address calculation

The bit in the byte that stores the dot is bit position 7 (X MOD 8).

The x value lies between 0 and 719
The y value lies between 0 and 347

The offset into the page of the byte containing dot (x,y) is:

[2000H x (Y MOD 4)]
+ [90 x INTEGER (Y/4)]
+ [INTEGER (X/8)]

Text generation

In the text mode, characters are stored contiguously in two 80-byte pairs per line. Each pair is comprised of one byte for character code and one byte for attribute code. The display is 80 characters in width by 25 lines in height.

Attribute and character codes for displayed characters are stored in the display buffer.

The attribute decoder has the functions of underline, reverse video, blank, boldface and blink for any character font. The character generator can produce the 256 ASCII characters.

Address calculation

The character code offset of a character is:

160 x (LINE - 1) + 2 x (COLUMN - 1)

The attribute code offset of a character is:

160 x (LINE - 1) + 2 x (COLUMN - 1) + 1

Any particular line must lie between 1 and 25.
Any particular column must lie between 1 and 80.

The offset of storage is: B0000 — B0FFF (4K)

The following rules are followed by the attribute decoder:

Attribute codes	7	6	5	4	3	2	1	0
Reverse video	B	1	1	1	I	0	0	0
Normal display	B	0	0	0	I	1	1	1
Underline	B	0	0	0	I	0	0	1
Blank	B	0	0	0	I	0	0	0

For normal body I = 0, for bold body I = 1
For blink off, display mode control port bit 5 =0
For blink on, display mode control port bit 5 =1
For normal background B= 0, for bold background B = 1
For no blink, B = 0, and for blink, B = 1

CON: interface

Configuration switch (03BF)

This software switch enables one of the three configurations of the card's memory map via this port. Accidental setting of the graphics mode is protected against by this port. Bit 0 uses bit 1 of the CON: Mode Control Port. Bit 1 uses bit 7 of the CON: Mode Control Port and either masks or brings page 1 into the memory map.

The interface to the monochrome display is achieved through the following I/O ports.

CON: Status Port	(03BA)
CON: Mode Control Port	(03B8)
6845 Index and Data Registers	(03B4-5)

CON: Status Port (03BA)

Real time status of the monochrome display is sensed by this port.

Bit 0	0 = Display active 1 = Screen blanked temporarily (horizontal reface)
Bit 3	0 = No dots 1 = Dots (Echoes video signal sent to screen)
Bit 7	0 = Screen blanked temporarily (vertical reface) 1 = Active display

Bits 1, 2, 4, 5 and 6 are not used.

CON: Mode Control Port (03B8)

The operational mode of the card is set through this 0 port.

NOTE: Be careful when changing between text and graphic modes. You must program both CON: Mode Control Port bit 1 and the 6845 Index and Data Registers with the proper parameters at the same time.

Bit 1
0 = Text mode (information from character generator and attribute-decoding logic)
1 = Graphics mode (information from graphics display buffer)

Bit 3
0 = Blanked screen
1 = Activated screen

Bit 5
0 = Text blink off
1 = Text blink on (Text blinks if attribute has bit 7 set and cursor remains unaffected)

Bit 7
0 = Page 0
1 = Page 1

Bits 0, 2, 4 and 6 are not used.

NOTE: Assembly language routines should be used to control CON: Mode Control Port bit 1 because the monitor may receive undefined vertical and horizontal frequencies when switching between text and graphics modes (memory access may be done in any language). See **Appendix C** for the appropriate listings.

Appendix A

Troubleshooting

If problems with the Graphicsmith arise, checking the following may be helpful:

- Check switch settings on your motherboard and make sure they are set for the monochrome display. You may need to consult the user manual for your motherboard to find the correct switch settings.

- Make sure that you are running software compatible with the Graphicsmith card. For example, software written for the IBM® Color Graphics Adapter such as Microsoft®'s Flight Simulator will not run on the Graphicsmith.

- Never use other graphics cards simultaneously which have the same screen buffer address. The IBM® Color Graphics Adapter, for example, uses the same screen buffer address.

- If you fail to solve your problem, your dealer can help you find the solution. Your dealer is always glad to provide you with advice and support.

Appendix B

Register descriptions

Bit 7	Bit 6	Bit 5	Bit 4
CRT status (03BA) R.O. Vertical - Sync	CRT status (03BA) R.O. Not used	CRT status (03BA) R.O. Not used	CRT status (03BA) R.O. Not used
CRT control (03B8) W.O. Page No.	CRT control (03B8) W.O. Not used	CRT control (03B8) W.O. Enable + Char. blink	CRT control (03B8) W.O. Not used

Bit 3	Bit 2	Bit 1	Bit 0
CRT status (03BA) R.O. Video + Output	CRT status (03BA) R.O. Reserved	CRT status (03BA) R.O. Reserved	CRT status (03BA) R.O. Hsync +
CRT control (03B8) W.O. Enable video	CRT control (03B8) W.O. Not used	CRT control (03B8) W.O. Select graphic mode	CRT control (03B8) W.O. Not used

Abbreviations:	
	R.O. — Read only
	W.O. — Write only
	R/W — Read and write

Appendix C

6845 Programming considerations

The following table summarizes the 6845 internal data registers, their functions and their parameters in the text and graphic modes.

Register number	Register name	Text mode (hexadecimal)	Graphics mode (hexadecimal)
R0	Horizontal total	61	35
R1	Horizontal displayed	50	2D
R2	Horizontal sync position	52	2E
R3	Horizontal sync width	F	07
R4	Vertical total	19	5B
R5	Vertical total adjust	6	02
R6	Vertical displayed	19	57
R7	Vertical sync position	19	57
R8	Interlace & skew	02	02
R9	Max. raster address	D	03

R10	Cursor start	B	00
R11	Cursor end	C	00
R12	Start address (H)	00	00
R13	Start address (L)	00	00
R14	Cursor (H)	00	00
R15	Cursor (L)	00	00
R16	Light pen (H)	—	—
R18	Light pen (L)	—	—